

National Climatic Data Center

DATA DOCUMENTATION

FOR

**DATASET 9724 (DSI-9724)**

Hourly Solar Radiation (SOLMET)

**January 20, 2004**

National Climatic Data Center  
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**1. Abstract:** Hourly radiation data are available at the National Climatic Data Center (NCDC). SOLMET was designed to provide the solar energy users with easy access to all appropriate historical meteorological data. The salient features of SOLMET are that it:

1. Merges all available insulation and meteorological data into a single source.
2. Presents all data in the International System of Units (SI).
3. Provides time information so user can access the information in true solar and/or standard time. The time of the meteorological observation is also indicated so that user will be aware of the meteorological observation that has been selected that is closest to time of the solar observation; i.e., selected to be the observation nearest to the midpoint of the solar hour. Provision is also made to handle data that are recorded in local standard time for conversion to solar time.
4. Allows for additional solar radiation parameters (such as direct and tilted, normal incidence, diffuse, net) that will be available from stations in the future. Allowance is also made in supplemental fields for additional measurements; i.e., ultraviolet, spectral, etc.
5. Converts all historical solar radiation data (including the extraterrestrial radiation field) to the same international scale based on the same solar constant.
6. Eliminates undesirable format features that were inherent in the past data sources such as over punches, blanks, etc.
7. Codes missing observations and those observations that are estimated via models (e.g., sunshine and cloud regression models)
8. Provides global solar radiation data as they were originally observed and provides the user with data corrected for all known scale, instrument, and calibration problems in addition to a data set corrected via a model.

**2. Element Names and Definitions:**

**Tape Format**

Field Number	Position	Element	Code Definition and Remarks
001	001-004	Tape Deck Number	
002	005-009	WBAN Station Number	Unique number used to identify each station.
003	010-019 010-011 012-013 014-015 016-019	Solar time Year Month Day Hour	Year of observation, 00-99 = 1900-1999 Month of observation, 01-12=Jan-Dec Day of month = 1-31 End of the hour of observation in solar time (hours and minutes)
004	020-023	Local Standard Time	Local Standard Time in hours and minutes corresponding to end of solar hour indicated in field 003
101	024-027	Extra-Terrestrial Radiation	Amount of solar energy in kJ/m <sup>2</sup> received at top of atmosphere during solar hour ending at time indicated on field 003, based on

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			solar constant = 1377J (m <sup>2</sup> .s) 9999 = nighttime values defined as zero kJ/m <sup>2</sup>
102	028-032 028 029-032	Direct radiation Data code Indicator Data	Portion of radiant energy in kJ/m <sup>2</sup> received at the pyrheliometer directly from the sun during solar hour ending at time indicated in field 003
103	033-037 033 034-037	Diffuse radiation Data code indicator Data	Amount of radiant energy in kJ/m <sup>2</sup> received at the instrument indirectly from reflection, scattering, etc., during the solar hour ending at the time indicated in field 003.
104	038-042 038 039-042	Net Radiation Data code indicator Data	Difference between the incoming and outgoing radiant energy in kJ/m <sup>2</sup> during the solar hour ending at the time indicated in field 003. A constant of 5000 has been added to all net radiation data.
105	043-047  043 044-047   048-062	Global radiation on a tilted surface Data code indicator Data   Global radiation on a horizontal surface	Total of direct and diffuse radiant energy in kJ/m <sup>2</sup> received on a tilted surface (tilt angle indicated in station - period of record list) during solar hour ending at the time indicated in field 003  Total of direct and diffuse radiant energy in kJ/m <sup>2</sup> received on a horizontal surface by a pyranometer during the solar hour ending at the time indicated in field 003
106	048-052 048 049-052	Observed data Data code indicator Data	Observed value
107	053-057 053 054-057	Engineering Corrected data Data code indicator Data	Observed value corrected for known scale changes, stations name, recorder and sensor calibration changes, etc.
108	058-062 058 059-062	Standard year Corrected data Data coded indicator Data	Observed value adjusted to Standard Year Model. This model yields

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			expected clear sky irradiance received on a horizontal surface at the elevation of the station.
109,110	063-072 063-068 064-067 069-072	Additional Radiation measurements Data code indicators Data Data	Supplemental fields A and B for additional radiation measurements; type of measurement specified in station-period of record list.
Note for fields 102-110: Data code indicators are:  0 Observed data 1 Estimated from model using sunshine and cloud data 2 Estimated from model using cloud data 3 Estimated from model using sunshine data 4 Estimated from model using sky condition data 5 Estimated from linear interpolation 6 Reserved for future use 7 Estimated from other model 8 Estimated without use of a model			
111	073-074	Minutes of sunshine	For Local Standard Hour (LSH) most closely matching solar hour.
201	075-076	Time of TD 1440 observation	LSH of TD 1440 Meteorological Observation that comes closest to midpoint of the solar hour for which solar data are recorded.
202	077-080	Ceiling height	Dam = ceiling height in decameters (m x 10); ceiling is defined as sky cover of .6 or greater. 7777 = unlimited; clear 8888 = unknown height of cirroform ceiling
203	081-085 081 082-085	Sky condition Indicator Sky condition	Identifies observations after 1 June 51. Coded by layer in ascending order; four layers are described; if less than 4 layers are present the remaining positions are coded 0. the code for each layer is:  0 = Clear or less than .1 cover 1 = Thin scattered (.1 - .5 cover) 2 = Opaque scattered (.1 - .5 cover) 3 = Thin broken (.6 - .9 cover) 4 = Opaque broken (.6 - .9 cover) 5 = Thin overcast (1.0 cover) 6 = Opaque overcast (1.0 cover) 7 = Obscuration 8 = Partial obscuration
204	086-089	Visibility	Prevailing horizontal visibility in hectometers (m x 10 <sup>2</sup> ). 8888 = unlimited
205	090-097 090	Weather Occurrence of	0 = None

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		thunderstorm, tornado or squall	<p>1 = thunderstorm - lightning and thunder. Wind gusts less than 50 knots and hail, if any less than ¼ inch diameter.</p> <p>2 = Heavy or severe thunderstorm - frequent lightning and thunder. Wind gusts 50 knots or greater and hail, if any, ¼ inch or greater diameter.</p> <p>3 = Report of tornado or waterspout</p> <p>4 = Squall (sudden increase of wind speed by at least 16 knots, reaching 22 knots or more and lasting for at least one minute).</p>
	091	Occurrence of rain, rain showers or freezing rain	<p>0 = None</p> <p>1 = Light rain</p> <p>2 = Moderate rain</p> <p>3 = heavy rain</p> <p>4 = Light rain showers</p> <p>5 = Moderate rain showers</p> <p>6 = Heavy rain showers</p> <p>7 = Light freezing rain</p> <p>8 = Moderate or heavy freezing rain</p>
	092	Occurrence of drizzle, freezing drizzle	<p>0 = None</p> <p>1 = Light drizzle</p> <p>2 = Moderate drizzle</p> <p>3 = Heavy drizzle</p> <p>4 = Light freezing drizzle</p> <p>5 = Moderate freezing drizzle</p> <p>6 = Heavy freezing drizzle</p>
	093	Occurrence of snow, snow pellets or ice crystals	<p>0 = None</p> <p>1 = Light snow</p> <p>2 = Moderate snow</p> <p>3 = Heavy snow</p> <p>4 = Light snow pellets</p> <p>5 = Moderate snow pellets</p> <p>6 = Heavy snow pellets</p> <p>7 = Light ice crystals</p> <p>8 = Moderate ice crystals</p> <p>Beginning April 1963 intensities of ice crystals were discontinued. All occurrences since this date are recorded as an 8.</p>
	094	Occurrence of snow showers and snow grains	<p>0 = None</p> <p>1 = Light snow showers</p> <p>2 = Moderate snow showers</p> <p>3 = Heavy snow showers</p> <p>4 = Light snow grains</p> <p>5 = Moderate snow grains</p> <p>6 = Heavy snow grains</p> <p>Beginning April 1963 intensities of</p>

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	095	Occurrence of sleet (ice pellets), sleet shower or hail	<p>snow grains were discontinued. All occurrences since this data are recorded as a 5.</p> <p>0 = None  1 = Light sleet or sleet showers (ice pellets)  2 = Moderate sleet or sleet showers (ice pellets)  3 = Heavy sleet or sleet showers (ice pellets)  4 = Light hail  5 = Moderate hail  6 = Heavy hail  7 = Light small hail  8 = Moderate or heavy small hail</p> <p>Prior to April 1970 ice pellets were coded as sleet. Beginning April 1970 sleet and small hail were redefined as ice pellets and are coded as a 1, 2 or 3 in this position. Beginning September 1956 intensities of hail were no longer reported and all occurrences were recorded as a 5.</p>
	096	Occurrence of fog, blowing dust or blowing sand	<p>0 = None  1 = Fog  2 = Ice fog  3 = Ground fog  4 = Blowing dust  5 = Blowing sand</p> <p>These values recorded only when visibility less than 7 miles.</p>
	097	Occurrence of smoke, haze, dust, blowing snow, blowing spray	<p>0 = None  1 = Smoke  2 = Haze  3 = Smoke and haze  4 = Dust  5 = Blowing snow  6 = Blowing spray</p> <p>These values recorded only when visibility is less than 7 miles.</p>
206	098-107 098-102	Pressure Sea level pressure	Pressure, reduced to sea level, in kilopascals (kPa) and hundredths.
	103-107	Station pressure	Pressure at station level in kilopascals (kPa) and hundredths.
207	108-115	Temperature	
	108-111	Dry bulb	°C and tenths
	112-115	Dew point	°C and tenths
208	116-122	Wind	Degrees

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	116-118 119-122	Wind direction Wind speed	m/s and tenths; 0000 with 000 direction indicated calm.
209	123-162 123-124 125-126  127-128   129-132   133-134 135-136 137-140  141-142 143-144 145-146 147-150 151-152 153-154 155-156 157-160  161-162	Clouds Total sky cover Lowest cloud layer amount Type of lowest cloud or obscuring phenomena Height of base of lowest cloud layer or obscuring phenomena Second layer amount Type of second layer Height of base of second cloud layer Summation of first 2 layers Third layer amount Type of third cloud layer Height of base of third cloud layer Summation of first 3 layers Fourth layer amount Type of fourth cloud layer Height of base of fourth cloud layer Total opaque sky cover	
Notes: (1) Tape configuration and remarks for total sky cover, cloud amount, summation of cloud layers and total opaque sky cover.			
	<b>Configuration</b>		<b>Remarks</b>
	00-10		Amount of celestial dome in tenths covered by clouds or obscuring phenomena. Opaque means clouds or obstruction through which the sky or higher cloud layers cannot be seen.
(2) Tape configuration and remarks for type of cloud or obscuring phenomena			
	00-16		Generic cloud type or obscuring phenomena. 0 = None 1 = Fog

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			2 = Stratus 3 = Stratocumulus 4 = Cumulus 5 = Cumulonimbus 6 = Altostratus 7 = Altocumulus 8 = Cirrus 9 = Cirrostratus 10 = Stratus fractus 11 = Cumulus fractus 12 = Cumulonimbus mamma 13 = Nimbostratus 14 = Altocumulus castellanus 15 = Cirrocumulus 16 = Obscuring phenomena other than fog
(3) Tape configuration and remarks for height of base of cloud layer of obscuring phenomena.			
	0000-3000 7777 8888		Dekameters 7777 = Unlimited, clear 8888 = Unknown height or cirroform layer
210	163	Snow cover indicator	0 indicates no snow or trace of snow on ground; 1 indicated more than trace of snow on ground

3. **Start Date:** 19511201

4. **Stop Date:** 19761231

5. **Coverage:**

- a. Southernmost Latitude: 15.0S
- b. Northernmost Latitude: 72.0N
- c. Westernmost Longitude: -165.0W
- d. Easternmost Longitude: -60.0E

6. **How to Order Data:**

Ask NCDC's Climate Services about the cost of obtaining this data set.  
Phone: 828-271-4800  
FAX: 828-271-4876  
E-mail: [NCDC.Orders@noaa.gov](mailto:NCDC.Orders@noaa.gov)

7. **Archiving Data Center:**

Archive Branch  
National Climatic Data Center  
151 Patton Avenue  
Asheville, NC 28801

8. **Technical Contact:**

National Climatic Data Center  
151 Patton Avenue

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Asheville, NC 28801

9. Known Uncorrected Problems: None.
10. Quality Statement:
11. Essential Companion Datasets:
12. References: